WHAT IS CLAIMED IS:

1. An optical amplifier comprising:

a gain medium operable to receive a plurality of signals each comprising a center wavelength; and

a noise figure associated with at least a portion of the amplifier and varying as a function of wavelength;

wherein at least two of the plurality of signals comprise a launch power that is a function of a magnitude of the noise figure measured at or near the center wavelength of that signal.

2. The optical amplifier of Claim 1, wherein each of the plurality of signals comprises a different center wavelength.

3. The optical amplifier of Claim 1, wherein the gain medium comprises a distributed Raman gain medium.

4. The optical amplifier of Claim 1, wherein the gain medium comprises a discrete Raman gain medium.

5. The optical amplifier of Claim 1, wherein the gain medium comprises a rare earth doped gain medium.

6. The optical amplifier of Claim 1, wherein the noise figure comprises a noise figure for the entire amplifier.

7. The optical amplifier of Claim 1, wherein the noise figure comprises a noise figure for one stage of the amplifier.

8. The optical amplifier of Claim 7, wherein the launch power of each of the at least two of the plurality of signals is determined as a function of a center wavelength of that signal and a noise figure of the amplifier stage measured at or near the center wavelength of that signal.

9. The optical amplifier of Claim 1, wherein each of the at least two of the plurality of signals provides an approximately equal signal to noise ratio at an output from the portion of the amplifier associated with the noise figure.

10. The optical amplifier of Claim 1, wherein the launch power of a majority of the plurality of signals comprises at least one decibel less than the launch power of the signal associated with the highest noise figure.

11. The optical amplifier of Clam 1, wherein the launch power of a majority of the plurality of signals comprises at least two decibels less than the launch power of the signal associated with the highest noise figure.

12. The optical amplifier of Claim 1, wherein the at least two of the plurality of signals each comprise a launch power that is a function of a magnitude of the noise figure measured within one nanometer of the center wavelength of that signal.

13. The optical amplifier of Claim 1, wherein the at least two of the plurality of signals each comprise a launch power that is proportional to the noise figure of the amplifier at or near the center wavelength of that signal.

14. The optical amplifier of Claim 1, wherein the at least two of the plurality of signals each comprise a launch power that approximately follows a noise figure of the amplifier as a function of wavelength.

15. The optical amplifier of Claim 1, wherein each of the plurality of signals comprises a launch power that that approximately follows a noise figure of the amplifier as a function of wavelength.

16. The optical amplifier of Claim 1, wherein the at least two of the plurality of signals each comprise a launch power that is inversely proportional to a signal to noise ratio at or near the center wavelength of that signal that would arise if all of the plurality of optical signals comprised the same launch power.

17. The optical amplifier of Claim 1, wherein the amplifier comprises a multiple stage amplifier, comprising:

a first amplifier stage operable to amplify the plurality of signals;

a second amplifier stage operable to amplify at least some of the plurality of signals after those signals have been amplified by the first stage;

wherein the first and second amplifier stages each comprise an approximately flat gain profile.

18. The optical amplifier of Claim 1, wherein the amplifier comprises a multiple stage amplifier, comprising:

a first amplifier stage having a first sloped gain profile operable to amplify the plurality of signals;

a second amplifier stage having a second sloped gain profile operable to amplify at least some of the plurality of signals after those signals have been amplified by the first stage, the second sloped gain profile being approximately complementary to the first sloped gain profile.

19. The optical amplifier of Claim 18, wherein the combined effect of the first and second amplifier stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths.

20. The optical amplifier of Claim 18, wherein the slope of the first gain profile has an approximately equal and opposite slope from the slope of the second gain profile.

21. The optical amplifier of Claim 18, wherein the first and second gain profiles each comprise a plurality of slopes.

22. The optical amplifier of Claim 18, wherein:

the first sloped gain profile comprises a gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the longer signal wavelengths are amplified more than a majority of the shorter signal wavelengths.

23. The optical amplifier of Claim 22, wherein a phonon stimulated noise figure of the amplifier comprises less than four decibels.

24. The optical amplifier of Claim 22, wherein a noise figure of the amplifier in the small signal limit comprises less than eight decibels over a bandwidth of at least forty (40) nanometers.

25. The optical amplifier of Claim 22, wherein a noise figure of the amplifier in the small signal limit comprises less than seven decibels over a bandwidth of at least forty (40) nanometers.

26. The optical amplifier of Claim 22, further comprising a third amplifier stage having a third sloped gain profile comprising a gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths.

27. The optical amplifier of Claim 26, wherein the combined effect of the first, second, and third, amplification stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths.

28. The optical amplifier of Claim 26, wherein the second amplifier stage comprises a Raman amplification stage.

29. The optical amplifier of Claim 22, further comprising:

a third amplifier stage having a third sloped gain profile wherein a majority of longer signal wavelengths are amplified more than a majority of shorter signal wavelengths; and

a fourth amplifier stage having a fourth sloped gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths.

30. The optical amplifier of Claim 29, wherein the combined effect of the first, second, third, and fourth amplifier stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths.

31. The optical amplifier of Claim 30, wherein:

the combined effect of the first and second amplifier stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths output from the second stage; and

wherein the combined effect of the third and fourth amplifier stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths output from the fourth stage.

32. The optical amplifier of Claim 18, wherein:

the first sloped gain profile comprises a gain profile wherein a majority of longer signal wavelengths are amplified more than a majority of shorter signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the shorter signal wavelengths are amplified more than a majority of the longer signal wavelengths.

33. The optical amplifier of Claim 32, wherein the first amplifier stage comprises a Raman amplification stage and wherein the first Raman stage is coupled to the second amplifier stage so as to allow longer wavelength pump signals in the first Raman stage to accept power from shorter wavelength pump signals in the second amplifier stage.

34. The optical amplifier of Claim 33, wherein the second amplifier stage comprises an amplifier stage selected from a group consisting of a Raman amplifier and a rare earth doped amplifier.

35. The optical amplifier of Claim 18, wherein each of the amplifier stages comprises a plurality of pump signals collectively operable to affect the slope and magnitude of the gain profile for that stage.

36. The optical amplifier of Claim 35, wherein the pump signal comprising the longest center wavelength comprises a center wavelength at least ten nanometers shorter than the shortest center wavelength of the plurality of signals.

37. The optical amplifier of Claim 35, wherein a majority of the gain applied to the signals having center wavelengths within thirty nanometers of the longest center wavelength pump signal is applied in the first stage of the amplifier.

38. The optical amplifier of Claim 35, wherein a majority of the gain supplied by the longest center wavelength pump signal is applied in a last stage of the amplifier.

39. The optical amplifier of Claim 18, further comprising at least one additional amplification stage coupled between the first and second Raman amplification stages.

40. The optical amplifier of Claim 1, wherein the bandwidth of the plurality of signals comprises more than forty nanometers.

41. The optical amplifier of Claim 1, wherein the bandwidth of the plurality of signals comprises more than eighty nanometers.

42. The optical amplifier of Claim 1, wherein the overall gain profile of the amplifier prior to use of a gain flattening filter varies by less than five decibels over at least a majority of the plurality of signal wavelengths.

43. An optical amplifier comprising:

an input operable to receive a plurality of signals each comprising a center wavelength, wherein at least two of the plurality of signals comprise different launch powers;

a pump operable to generate a pump signal;

a gain medium operable to receive the plurality of signals and the pump signal and to facilitate amplification of at least some of the plurality of signals; and

an output operable to communicate amplified versions of the plurality of signals;

wherein a signal to noise ratio measured at the output of the amplifier varies by no more than 2.5 decibels over a bandwidth of at least 40 nanometers for at least a majority of signals output from the amplifier.

44. The optical amplifier of Claim 43, wherein the gain medium comprises a distributed Raman gain medium.

45. The optical amplifier of Claim 43, wherein the gain medium comprises a discrete Raman gain medium.

46. The optical amplifier of Claim 43, wherein the gain medium comprises a rare earth doped gain medium.

47. The optical amplifier of Claim 43, wherein the launch power of each of the at least two of the plurality of signals is determined as a function of a center wavelength of that signal and a noise figure of at least a portion of the amplifier measured at or near the center wavelength of that signal.

48. The optical amplifier of Claim 43, wherein the amplifier comprises a multiple stage amplifier, comprising:

a first amplifier stage operable to amplify the plurality of signals;

a second amplifier stage operable to amplify at least some of the plurality of signals after those signals have been amplified by the first stage;

wherein the first and second amplifier stages each comprise an approximately flat gain profile.

49. The optical amplifier of Claim 43, wherein the amplifier comprises a multiple stage amplifier, comprising:

a first amplifier stage having a first sloped gain profile operable to amplify the plurality of signals;

a second amplifier stage having a second sloped gain profile operable to amplify at least some of the plurality of signals after those signals have been amplified by the first stage, the second sloped gain profile being approximately complementary to the first sloped gain profile.

50. The optical amplifier of Claim 49, wherein the combined effect of the first and second amplifier stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths.

51. The optical amplifier of Claim 49, wherein:

the first sloped gain profile comprises a gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the longer signal wavelengths are amplified more than a majority of the shorter signal wavelengths.

52. The optical amplifier of Claim 51, further comprising a third amplifier stage having a third sloped gain profile comprising a gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths.

53. The optical amplifier of Claim 52, wherein the second amplifier stage comprises a Raman amplification stage.

54. The optical amplifier of Claim 51, further comprising:

a third amplifier stage having a third sloped gain profile wherein a majority of longer signal wavelengths are amplified more than a majority of shorter signal wavelengths; and

a fourth amplifier stage having a fourth sloped gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths.

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55. The optical amplifier of Claim 54, wherein:

the combined effect of the first and second amplifier stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths output from the second stage; and

wherein the combined effect of the third and fourth amplifier stages contributes to an approximately flat overall gain profile over the plurality of signal wavelengths output from the fourth stage.

56. The optical amplifier of Claim 49, wherein:

the first sloped gain profile comprises a gain profile wherein a majority of longer signal wavelengths are amplified more than a majority of shorter signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the shorter signal wavelengths are amplified more than a majority of the longer signal wavelengths.

57. The optical amplifier of Claim 56, wherein the first amplifier stage comprises a Raman amplification stage and wherein the first Raman stage is coupled to the second amplifier stage so as to allow longer wavelength pump signals in the first Raman stage to accept power from shorter wavelength pump signals in the second amplifier stage.

58. The optical amplifier of Claim 49, further comprising at least one additional amplification stage coupled between the first and second Raman amplification stages.

59. The optical amplifier of Claim 43, wherein the bandwidth of the plurality of signal wavelengths comprises at least sixty nanometers.

60. The optical amplifier of Claim 43, wherein the bandwidth of the plurality of signal wavelengths comprises at least eighty nanometers.

61. The optical amplifier of Claim 43, wherein the overall gain profile of the amplifier prior to use of a gain flattening filter varies by less than five decibels over at least a majority of the plurality of signal wavelengths.

62. The optical amplifier of Claim 43, wherein the signal to noise ratio varies by no more than one decibel for at least a majority of optical signals output from the amplifier.

63. The optical amplifier of Claim 43, wherein the signal to noise ratio varies by no more than 0.1 decibels for at least a majority of optical signals output from the amplifier.

64. An optical communication system comprising:

an input terminal comprising a plurality of optical transmitters each operable to output one of a plurality of signals each comprising a center wavelength;

a plurality of spans of optical medium coupled to the input terminal and operable to facilitate communication of the plurality of signals; and

a plurality of in-line amplifiers each coupled to at least one of the plurality of spans of optical medium;

wherein at least two of the plurality of signals comprise a launch power that is a function of a noise figure associated with at least a portion of the system.

65. The optical communication system of Claim 64, wherein the plurality of transmitters comprises a plurality of pairs of optical sources and modulators.

66. The optical communication system of Claim 64, wherein each of the plurality of transmitters comprises a modulator operable to receive from a common optical source an unmodulated signal having a center wavelength and to modulate the received signal.

67. The optical communication system of Claim 66, wherein the common optical source comprises:

a modelocked pulse source operable to generate a plurality of optical pulses;

a continuum generator operable to broaden the spectrum of the plurality of optical pulses into an approximate spectral continuum of optical pulses; and

a signal splitter operable to generate from the approximate continuum a plurality of unmodulated signals each comprising a center wavelength.

68. The optical communication system of Claim 64, wherein at least one of the plurality of in-line amplifiers comprises a distributed Raman amplification stage.

69. The optical communication system of Claim 64, wherein at least one of the plurality of in-line amplifiers comprises a discrete Raman amplification stage.

70. The optical communication system of Claim 64, wherein at least one of the plurality of in-line amplifiers comprises a rare earth doped amplification stage.

71. The optical communication system of Claim 64, wherein the launch power of each of the at least two of the plurality of signals is determined as a function of a center wavelength of that signal and a noise figure of the amplifier stage measured at or near the center wavelength of that signal.

72. The optical communication system of Claim 64, wherein at least one of the in-line amplifiers comprises a multiple stage amplifier, comprising:

a first amplifier stage operable to amplify the plurality of signals;

a second amplifier stage operable to amplify at least two of the plurality of signals after those signals have been amplified by the first stage;

wherein the first and second amplifier stages each comprise an approximately flat gain profile.

73. The optical communication system of Claim 64, wherein at least one of the in-line amplifiers comprises a multiple stage amplifier, comprising:

a first amplifier stage having a first sloped gain profile operable to amplify the plurality of signals;

a second amplifier stage having a second sloped gain profile operable to amplify at least two of the plurality of signals after those signals have been amplified by the first stage, the second sloped gain profile being approximately complementary to the first sloped gain profile.

74. The optical communication system of Claim 73, wherein the first sloped gain profile comprises a gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the longer signal wavelengths are amplified more than a majority of the shorter signal wavelengths.

75. The optical communication system of Claim 74, further comprising a third amplifier stage having a third sloped gain profile comprising a gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths.

76. The optical communication system of Claim 74, further comprising:

a third amplifier stage having a third sloped gain profile wherein a majority of longer signal wavelengths are amplified more than a majority of shorter signal wavelengths; and

a fourth amplifier stage having a fourth sloped gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths.

77. The optical communication system of Claim 73, wherein:

the first sloped gain profile comprises a gain profile wherein a majority of longer signal wavelengths are amplified more than a majority of shorter signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the shorter signal wavelengths are amplified more than a majority of the longer signal wavelengths.

78. The optical communication system of Claim 77, wherein the first amplifier stage comprises a Raman amplification stage and wherein the first Raman stage is coupled to the second amplifier stage so as to allow longer wavelength pump signals in the first Raman stage to accept power from shorter wavelength pump signals in the second amplifier stage.

79. The optical communication system of Claim 64, wherein the bandwidth of the plurality of signal wavelengths comprises at least forty nanometers.

80. The optical communication system of Claim 64, wherein the bandwidth of the plurality of signal wavelengths comprises at least eighty nanometers.

81. The optical communication system of Claim 64, wherein the overall gain profile of the amplifier prior to use of a gain flattening filter varies by less than five decibels over at least a majority of the plurality of signal wavelengths.

82. The optical communication system of Claim 64, further comprising a management element operable to determine launch powers for the at least two of the plurality of signals based at least in part on a noise figure associated with at least a portion of the system.

83. The optical communication of Claim 64, further comprising a signal combiner operable to combine the plurality of signals into a multiple wavelength signal prior to communication to the plurality of spans of optical medium.

84. The optical communication system of Claim 64, further comprising a signal separator operable to separate the signals from the multiple wavelength signal received from one of the plurality of spans.

85. The optical communication system of Claim 64, further comprising a lossy element coupled to one of the plurality of spans, wherein the lossy element comprises an element selected from a group consisting of an isolator, a gain equalizer, an add/drop multiplexer, and a cross connect.

86. The optical communication system of Claim 64, wherein the plurality of optical signals comprises:

a first group of optical signals having launch powers determined with reference to the noise figure to result in a first signal to noise ratio; and

a second group of optical signals having launch powers determined with reference to the noise figure to result in a second signal to noise ratio different than the first signal to noise ratio.

87. A method of communicating signals, comprising:

communicating a plurality of signals each having a center wavelength to an optical link comprising a plurality of spans of fiber; and

amplifying the plurality of signals to at least partially compensate for losses in one or more of the plurality of spans of fiber;

wherein signals output from the optical link experience a noise figure varying as a function of wavelength, and wherein at least two of the signals input to the optical link comprise a launch power that is a function of the noise figure measured at or near the center wavelength of that signal.

88. The method of Claim 87, wherein communicating a plurality of signals comprises generating each of the plurality of signals using a separate optical source.

89. The method of Claim 87, wherein communicating a plurality of signals comprises:

generating a plurality of unmodulated signals using a common optical source; and

modulating each of the unmodulated signals using a separate modulator.

90. The method of Claim 87, wherein the optical link comprises at least one discrete Raman amplification stage.

91. The method of Claim 87, wherein the optical link comprises at least one distributed Raman amplification stage.

92. The method of Claim 87, wherein the optical link comprises at least one rare earth doped amplification stage.

93. The method of Claim 87, wherein amplifying the plurality of signals comprises amplifying the plurality of signals with at least one multiple-stage amplifier having an approximately flat gain profile in each amplifier stage.

94. The method of Claim 87, wherein amplifying the plurality of signals comprises:

applying a first sloped gain profile to a plurality of signals at a first stage of an amplifier in the optical link;

applying a second sloped gain profile to two of the plurality of signals at a second stage of the amplifier, the second sloped gain profile comprising an approximately complementary gain profile of the first sloped gain profile.

95. The method of Claim 94, wherein the combined effect of the first and second sloped gain profiles contributes to an approximately flat overall gain profile over the plurality of signal wavelengths.

96. The method of Claim 94, wherein:

the first sloped gain profile comprises a gain profile wherein a majority of shorter signal wavelengths are amplified more than a majority of longer signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the longer signal wavelengths are amplified more than a majority of the shorter signal wavelengths.

97. The method of Claim 94, wherein:

the first sloped gain profile comprises a gain profile wherein a majority of longer signal wavelengths are amplified more than a majority of shorter signal wavelengths; and

the second sloped gain profile comprises a gain profile wherein a majority of the shorter signal wavelengths are amplified more than a majority of the longer signal wavelengths.

98. The method of Claim 87, wherein the signals output from the optical link comprise signals output from an access element coupled to the optical link.

99. The method of Claim 87, wherein the signals output from the optical link comprise signals output to a receiver at an end of the optical link.

100. The method of Claim 87, wherein the launch power of the at least two of the signals input to the optical link comprise a function of the center wavelength of the signal and the noise figure measured at or near the signal's center wavelength.

101. The method of Claim 87, wherein the at least two of the plurality of signals each comprise a launch power that is a function of a magnitude of the noise figure measured within one nanometer of the center wavelength of that signal.

102. The method of Claim 87, wherein the at least two of the plurality of signals each comprise a launch power that is proportional to the noise figure of the amplifier at or near the center wavelength of that signal.

103. The method of Claim 87, wherein the at least two of the plurality of signals each comprise a launch power that approximately follows a noise figure of the amplifier as a function of wavelength.

104. The method of Claim 87, wherein each of the plurality of signals comprises a launch power that that approximately follows a noise figure of the amplifier as a function of wavelength.

105. The method of Claim 87, wherein the at least two of the plurality of signals each comprise a launch power that is inversely proportional to a signal to noise ratio at or near the center wavelength of that signal that would arise if all of the plurality of optical signals comprised the same launch power.

106. The method of Claim 87, wherein a signal to noise ratio associated with the plurality of signals measured at the output from the optical link varies by no more than 2.5 decibels for at least a majority of signals output from the optical link.

107. The method of Claim 87, wherein a signal to noise ratio associated with the plurality of signals measured at the output from the optical link varies by no more than 1 decibel for at least a majority of signals output from the optical link.

108. The method of Claim 87, wherein a signal to noise ratio associated with the plurality of signals measured at the output from the optical link varies by no more than 0.1 decibels for at least a majority of optical signals output from the optical link.

109. A method of communicating signals, comprising:

(a) adjusting launch powers of a plurality of signals input to an optical link based at least in part on a noise figure associated with at least a portion of the optical link;

(b) adjusting a pump power of an amplifier in the optical link to give a desired gain spectrum in light of the adjusted launch powers; and

(c) repeating steps (a) and (b) until a signal to noise ratio at an output from the optical link varies by no more than a threshold amount for at least a majority of signals output from the optical link.

110. The method of Claim 109, wherein adjusting the launch power of a plurality of signals comprises adjusting the launch power as a function of the center wavelength of the signal and the noise figure measured at or near the signal's center wavelength.

111. The method of Claim 109, wherein the optical link comprises at least one discrete Raman amplification stage.

112. The method of Claim 109, wherein the optical link comprises at least one distributed Raman amplification stage.

113. The method of Claim 109, wherein the optical link comprises at least one rare earth doped amplification stage.

114. The method of Claim 109, wherein the threshold level comprises 2.5 decibels for at least a majority of signals output from the optical link.

115. The method of Claim 109, wherein the threshold level comprises 1 decibel for at least a majority of signals output from the optical link.

116. The method of Claim 109, wherein the threshold level comprises 0.1 decibels for at least a majority of signals output from the optical link.

117. The method of Claim 109, further comprising:

monitoring the noise figure of at least a portion of the optical link during operation;

adjusting the launch powers of a plurality of signals input to the optical link based at least in part on the noise figure monitored during operation.

118. The method of Claim 117, wherein monitoring the noise figure comprises determining the noise figure on a periodic basis.

119. A method of communicating signals, comprising:

setting launch powers of a plurality of signals at an initial launch power level;

setting a pump power of an amplifier in an optical link receiving the plurality of signals at an initial pump power level to give a desired gain spectrum at the output of the amplifier;

adjusting the launch powers based at least in part on a noise figure associated with at least a portion of the optical link; and

adjusting the pump power of the amplifier to retain the desired gain spectrum in light of the adjustment to the launch powers.

120. The method of Claim 119, wherein adjusting the launch power of a plurality of signals comprises adjusting the launch power as a function of the center wavelength of the signal and the noise figure measured at or near the signal's center wavelength.

121. The method of Claim 119, wherein the optical link comprises at least one discrete Raman amplification stage.

122. The method of Claim 119, wherein the optical link comprises at least one distributed Raman amplification stage.

123. The method of Claim 119, wherein the optical link comprises at least one rare earth doped amplification stage.

124. The method of Claim 119, wherein the launch powers are adjusted to ensure a signal to noise ratio for each of the plurality of signals measured at an output from the optical link that varies by no more than 2.5 decibels for at least a majority of signals output from the optical link.

125. The method of Claim 119, wherein the launch powers are adjusted to ensure a signal to noise ratio for each of the plurality of signals measured at an output from the optical link that varies by no more than 1 decibel for at least a majority of signals output from the optical link.

126. The method of Claim 119, wherein the launch powers are adjusted to ensure a signal to noise ratio for each of the plurality of signals measured at an output from the optical link that varies by no more than 0.1 decibels for at least a majority of signals output from the optical link.